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β-Decay Spectroscopy of 58Zn

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Gamow-Teller (GT) transitions play important roles in the studies of nuclear structure and nucleosynthesis. In the A = 58 isobars, the GT transition strengths to the states in 58Cu have been measured by high-resolution 58Ni(3He,t)58Cu reactions of ΔE ~ 30 keV. In order to discuss isospin symmetry in the A = 58 isobars, we studied the β decay of 58Zn. In addition, the β decay of 58Zn has the 0+⟶0+ super-allowed Fermi branch. Therefore, it is possible to discuss the isospin symmetry breaking, the unitarity of CKM matrix, and CVC hypothesis by measuring the precise ft value for the Fermi transition.
The experiment was performed at RI beam factory (RIBF) at RIKEN. The secondary beams including 58Zn and other proton rich nuclei of pf-shell were produced, separated, and identified by using the BigRIPS separator. Then, they were implanted into WAS3ABi consisting of 3 DSSSDs placed at the end of Zero-degree spectrometer. The implantation of the heavy ions and the β-delayed charged particles were measured by WAS3ABi. The β-delayed γ rays were measured by Ge Cluster detectors, the EURICA setup. As a result, the β-decay half-life of 58Zn was obtained very precisely. The accuracy is 20 times better than these in previous results. In addition, we discovered new decay branches to the excited state above the proton separation energy in 58Cu.

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